

**In the Claims:**

1. A multilayer biodegradable matrix for tissue regeneration, said matrix comprising two layers, each of said layers comprising a cross-linked polymeric component  
5 selected from the group consisting of a protein and a polysaccharide.

2. A matrix according to Claim 1 wherein said polymeric component is selected from the group consisting of collagen, albumin, fibrinogen, fibronectin, vitronectin, laminin, hyaluronic acid, dextran, dextran sulfate, chondroitin sulfate, dermatan sulfate, keratan  
10 sulfate, chitin, chitosan, heparin, heparin sulfate and alginate.

3. A matrix according to Claim 1 wherein said protein and/or polysaccharide in each layer is covalently cross-linked.

15 4. A matrix according to Claim 1 wherein said protein selected from the group consisting of collagen, albumin, fibrinogen, fibronectin, vitronectin, and laminin.

5. A matrix according to Claim 1 wherein said polysaccharide is a member selected from the group consisting of hyaluronic acid, dextran, dextran sulfate, chondroitin  
20 sulfate, dermatan sulfate, keratan sulfate, heparin, heparan sulfate, chitosan, chitin, and alginate.

6. A matrix according to Claim 1 wherein said layers attach to each other through chemical cross-linking.  
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7. A matrix according to Claim 1 wherein said layers mechanically adhere to each other.

8. A matrix according to Claim 1 wherein said layers are different in chemical  
30 composition from each other.

9. A matrix according to Claim 1 wherein said layers are different in physical density from each other.

10. A matrix according to Claim 1 wherein said layers are different in structural porosity from each other.

11. A matrix of claim 8 wherein one layer comprises hyaluronate and another layer comprises collagen.

12. A matrix of claim 9 wherein one layer comprises hyaluronate and another layer comprises collagen.

13. A matrix of claim 10 wherein one layer comprises hyaluronate and another layer comprises collagen.

14. A matrix according to Claim 3 wherein said protein and/or polysaccharide are cross-linked with divinyl sulfone.

15. A matrix according to Claim 3 wherein said protein and/or polysaccharide are cross-linked with bi-, tri-, or poly-aldehyde.

16. A matrix according to Claim 15 wherein said poly-aldehyde comprises an oxidized polysaccharide derivative carrying aldehyde groups.

17. A matrix according to Claim 6 wherein said layers are chemically cross-linked to each other by treatment with divinyl sulfone.

18. A matrix according to Claim 6 wherein said layers are chemically cross-linked to each other by thermal dehydration.

19. A matrix according to Claim 1 contains a growth factor, cDNA, gene

construct, hormone, or other biologically active substance.

20. A matrix according to Claim 19 wherein each of said layers contains a growth factor, cDNA, or gene construct, hormone, or other biologically active substance.

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21. A method of repairing and generating tissues *in vivo*, comprising the step of applying a matrix of Claim 1 at a site of desired tissue regeneration.

22. A method according to Claim 21 comprising the step of applying said matrix at a site of desired bone growth.

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23. A method according to Claim 21 comprising the step of applying said matrix at a site of desired cartilage growth.

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24. A method according to Claim 21 comprising the step of applying said matrix at a site of desired joint repair.

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25. A method for preparing a biodegradable multilayer matrix for tissue regeneration, said method comprising the step of applying a first cross-linked polymeric layer comprising a polysaccharide or protein cross-linked to another polysaccharide or protein, to a second cross-linked polymeric layer comprising a polysaccharide or protein cross-linked to a polysaccharide or protein, wherein said polysaccharides and proteins are independently selected from the group consisting of collagen, albumin, fibrinogen, fibronectin, vitronectin, laminin, hyaluronic acid, dextran, dextran sulfate, chondroitin sulfate, dermatan sulfate, keratan sulfate, chitin, chitosan, heparan, heparan sulfate and alginate.

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26. The method of Claim 25 wherein said first polymeric layer comprises two polysaccharides or proteins cross-linked to each other.

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27. The method of Claim 26 wherein said first polymeric layer comprises collagen cross-linked to collagen.

28. The method of Claim 25 wherein said first polymeric layer comprises two  
5 different polysaccharides or proteins cross-linked to each other.

29. The method of Claim 28 wherein said first polymeric layer comprises hyaluronate cross-linked to collagen.

10 30. The method of Claim 25 wherein said first polymeric layer is applied to said second polymeric layer by chemical cross-linking with divinyl sulfone.

31. A method according to Claim 25 further comprising the step of incorporating  
into said matrix at least one growth factor, cDNA, gene construct, hormone or other  
15 biologically active substance.

32. A method according to Claim 31 wherein said growth factor, cDNA, gene  
construct, hormone, or other biologically active substance is incorporated after matrix  
fabrication.

20 33. A method according to Claim 31 wherein said growth factor, cDNA, gene construct, hormone, or other biologically active substance is loaded during matrix fabrication.

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